CARPENTRY I

COURSE DESCRIPTION

Carpentry I **is a course that will introduce students to basic skills and knowledge related to residential and commercial carpentry. Topics covered include wood, metal, and concrete building materials; fasteners; hand and power tools; fabrication based on construction plans; and framing of platform and post-and-beam structures, in both wood and metal. This course gives students an introduction to the skill and knowledge base typically required for apprentice carpenters.**

Prerequisite(s): Construction Core

Algebra I or Math for Technology II.(may be concurrent)

Recommended Credits: 2

Recommended Grade Level(s): 11th

CARPENTRY I STANDARDS

1.0 Students will demonstrate leadership, citizenship, and teamwork skills required for success in the school, community, and workplace.

2.0 Students will assume responsibility for the safety of themselves, their coworkers, and bystanders.

3.0 Students will interpret, lay out, and fabricate in conformance to construction drawings and written specifications.

4.0 Students will identify and select typical wood building materials and fasteners.

5.0 Students will use appropriate hand and power tools to safely achieve industry accepted results.

6.0 Students will construct forms; install reinforcement; and place, finish, and cure concrete in accordance with construction drawings and specifications.

7.0 Students will compare and contrast post-and-beam structures, platform structures, load-bearing walls, panel walls, and curtain walls.

8.0 Students will compare and contrast dimensioned lumber, engineered shapes, and trussed structures for load-bearing span applications.

9.0 Students will demonstrate the importance of bridging and diagonal bracing of floor and wall structures.

CARPENTRY I

STANDARD 1.0

Students will demonstrate leadership, citizenship, and teamwork skills required for success in the school, community, and workplace.

LEARNING EXPECTATIONS

The student will:

1.1 Cultivate leadership skills.
1.2 Participate in SkillsUSA-VICA as an integral part of instruction.
1.3 Assess situations within the school, community, and workplace and apply values to develop and select solutions.
1.4 Demonstrate the ability to work cooperatively with others.

PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET

The student:

1.1.A Takes initiative in meetings to actively influence the results of deliberations.
1.1.B Uses critical-thinking and consensus building skills in group deliberations.
1.2.A Applies high ethical standards to personal, community, and professional situations.
1.2.B Participates and conducts meetings according to accepted rules of parliamentary procedure.
1.3.A Analyzes simulated workplace situations and uses problem-solving and critical-thinking techniques to suggest solutions to the problem.
1.3.B Analyzes socio-economic conflicts associated with the construction industry and applies values to evaluate possible ways to mitigate the conflicts.
1.4.A Participates in a committee.
1.4.B Contributes to a group project.

SAMPLE PERFORMANCE TASKS

These are sample projects of the type and scale recommended to address one or more of the learning expectations for this standard. Other projects can be used at the instructor's discretion.

- Create a leadership inventory and use it to conduct a personal assessment.
- Participate in various SkillsUSA-VICA or similar programs and/or competitive events.
- Evaluate a civic project within the school, community, and/or workplace and evaluate the expected long term effects of the project.
- Prepare a meeting agenda for a school or community meeting.
- Attend the meeting of a professional organization.
- Participate in a design team to complete an assigned project.

INTEGRATION LINKAGES

SkillsUSA-VICA, *Professional Development Program,* SkillsUSA-VICA, Communications and Writing Skills, Teambuilding Skills, Research, Language Arts, Sociology, Psychology, Math, Math for Technology, Applied Communications, Social Studies, Problem Solving, Interpersonal Skills, Employability Skills, Critical-Thinking Skills, SCANS (Secretary's Commission on Achieving Necessary Skills), Chamber of Commerce, Colleges, Universities, Technology Centers, and Employment Agencies

STANDARD 2.0

Students will assume responsibility for the safety of themselves, their coworkers, and bystanders.

LEARNING EXPECTATIONS

The student will:

2.1 Develop a positive attitude regarding safety practices and issues.
2.2 Use and inspect personal protective equipment.
2.3 Inspect, maintain, and employ safe operating procedures with tools and equipment, such as hand and power tools, ladders, scaffolding, and lifting equipment.
2.4 Demonstrate continuous awareness of potential hazards to self and others.
2.5 Comprehend personal responsibilities under HazCom (Hazard Communication) regulations.
2.6 Comprehend personal responsibilities, regulations, and company policies to protect coworkers and bystanders from hazards.
2.7 Comprehend personal responsibilities, regulations, and company policies regarding reporting of accidents and observed hazards and regarding emergency response procedures.
2.8 Demonstrate appropriate construction-related safety procedures.

PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET

The student:

2.1.A Is attentive during safety discussions.
2.1.B Actively seeks information about safe procedures.
2.1.C Responds positively to instruction, advice, and correction regarding safety issues.
2.1.D Does not deliberately create or increase hazards, such as by horseplay, practical jokes, or creating distractions.
2.1.E Reports to school or work physically ready to perform to professional standards, such as rested, or not impaired by medications, drugs, alcohol, and so forth.
2.2.A Selects, inspects, and uses the correct personal protective equipment for the assigned task.
2.3.A Inspects power tools for intact guards, shields, insulation, and other protective devices.
2.3.B Inspects extension cords for the presence of a functional ground connection, prior to use.
2.3.C Operates and maintains tools in accordance with manufacturer's instructions and as required by regulation and/or company policy.
2.3.D Properly places and secures ladders and scaffolding prior to use.
2.4.A Is observant of personnel and activities in the vicinity of the work area.
2.4.B Warns nearby personnel, prior to starting potentially hazardous actions.
2.5.A When asked to use a new hazardous material, retrieves material safety data sheet (MSDS), and identifies the health hazards associated with the new material.
2.5.B Reports hazards found on the job site to their supervisor.
2.6.A Erects shields, barriers, and signage to protect coworkers and bystanders prior to starting potentially hazardous tasks.
2.6.B Provides and activates adequate ventilation equipment as required by the task.
2.7.A Reports all injuries to self to the immediate supervisor.
2.7.B Reports observed unguarded hazards to the immediate supervisor.

2.7.C Complies with personal assignments regarding emergency procedures.
2.8.A Passes with 100 % accuracy a written examination relating to safety issues.
2.8.B Passes with 100% accuracy a performance examination relating to safety.
2.8.C Maintains a portfolio record of written safety examinations and equipment examinations for which the student has passed an operational checkout by the instructor.

SAMPLE PERFORMANCE TASKS

These are sample projects of the type and scale recommended to address one or more of the learning expectations for this standard. Other projects can be used at the instructor's discretion.

- Practice drill simulating a hazardous solvent spill in which an emergency action plan is to be implemented.
- Instruct a visitor to obviously approach the vicinity of a student conducting a hazardous activity, and note the level of awareness demonstrated by the student.
- For a project requiring the use of ladders and/or scaffolding, note the proper placement and securing procedures followed by students.

INTEGRATION/LINKAGES

Science, Computer Skills, Research and Writing skills, Language Arts, Communication Skills, Leadership Skills, Teamwork Skills, Math for Technology, Applied Communications, Applied Mathematics, Secretary's Commission on Achieving Necessary Skills (SCANS), Skills USA-VICA, Associated Builders and Contractors (ABC), Associated General Contractors (AGC), National Center for Construction Education and Research (NCCER), Occupational Safety and Health Administration (OSHA), Environmental Protection Agency, United States Department of Labor, Tennessee Department of Labor and Workforce Development

STANDARD 3.0

Students will interpret, lay out, and fabricate in conformance to construction drawings and written specifications.

LEARNING EXPECTATIONS

The student will:

3.1 Interpret dimensions and locations of components that are explicitly dimensioned in construction drawings and written specifications.
3.2 Interpret plan and elevation views shown in construction drawings.
3.3 Recognize and correctly interpret lines and symbols commonly used in construction drawings.
3.4 Make layouts of locations and elevations of structural elements with special requirements.

PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET

The student:

3.1.A Makes a material take-off in conformance to construction drawings and specifications.
3.1.B Lays out components, structural and others, and their locations to dimensions and tolerances indicated on construction drawings and written specifications.
3.2.A Interprets three-dimensional features found in construction drawings.
3.3.A Distinguishes between object lines, dimension and extension lines, center lines, section lines, and other lines commonly found in construction drawings.
3.3.B Identifies symbols commonly used in construction drawings, including material, window and door, electrical, plumbing, HVAC, and plot plan and survey symbols.
3.3.C Correlates symbols in electrical schematic and ladder diagrams with physical, electrical components and their interconnections.
3.4.A Lays out locations and elevations of stairs and handrails.
3.4.B Lays out locations and elevations for plumbing and HVAC requiring special access or strength.

SAMPLE PERFORMANCE TASKS

These are sample projects of the type and scale recommended to address one or more of the learning expectations for this standard. Other projects can be used at the instructor's discretion.

- Given a set of plans and specifications for a residential or a commercial structure, make a complete material take-off for windows and doors.
- Given a set of plans and specifications for a residential or a commercial structure, determine the location of structural elements not explicitly dimensioned.
- Given a set of plans and specifications for a residential or a commercial structure, make provision for reasonable routing and support of ducts, electrical wiring, and plumbing.
- Construct batter boards and lay out a foundation plan based on a construction drawing, including grade stakes, locations of concrete forms, and plumbing and electrical stub-ups, e.g., using stakes, hammers, steel tapes, and builder's levels.

INTEGRATION/LINKAGES

Science, Computer Skills, Research and Writing skills, Language Arts, Communication Skills, Leadership Skills, Teamwork Skills, Applied Communications, Secretary's Commission on Achieving Necessary Skills (SCANS), Skills USA-VICA, Associated Builders and Contractors (ABC), Associated General Contractors (AGC), National Center for Construction Education and Research (NCCER), Occupational Safety and Health Administration (OSHA), Environmental Protection Agency, United States Department of Labor, Tennessee Department of Labor and Workforce Development

STANDARD 4.0

Students will identify and select typical wood building materials and fasteners.

LEARNING EXPECTATIONS

The student will:

4.1 Distinguish between and select various types, cuts, and grades of dimensioned lumber.
4.2 Distinguish between and select various types, cuts, and grades of manufactured and engineered wood products.
4.3 Distinguish between and select uses for various types and sizes of nails, bolts, and screws.

PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET

The student:

4.1.A Identifies uses of hardwood and softwood dimensioned lumber.
4.1.B Identifies standard dimensions of structural dimensioned lumber.
4.1.C Identifies and interprets grade markings on dimensioned lumber.
4.1.D Selects dimensioned lumber of an appropriate grade for a given application.
4.2.A Identifies standard dimensions of manufactured and engineered wood products.
4.2.B Identifies and interprets grade markings on manufactured and engineered wood products.
4.2.C Selects manufactured and engineered wood products of an appropriate grade for a given application.
4.3A Identifies and selects by sight the sizes and types of commonly encountered nails.
4.3B Identifies and selects by sight the sizes and types of commonly encountered bolts and screws.

SAMPLE PERFORMANCE TASKS

These are sample projects of the type and scale recommended to address one or more of the learning expectations for this standard. Other projects can be used at the instructor's discretion.

- Take a field trip to a local lumber yard or building supply where students will identify lumber and manufactured and engineered wood products by observation and grade markings.
- Take a field trip to a local lumber yard or building supply where students, equipped with an inexpensive digital camera, will be asked to find and photograph material on a list, e.g., various dimensions, grades, cuts, and specifications.
- Given a specified list of nails, bolts, and screws, fill the list from a stock area.
- Given a floor-system construction project, select between reasonable alternatives of dimensioned lumber, manufactured and engineered wood products, and the required fasteners.

INTEGRATION/LINKAGES

Science, Computer Skills, Research and Writing skills, Language Arts, Communication Skills, Leadership Skills, Teamwork Skills, Applied Communications, Secretary's Commission on Achieving Necessary Skills (SCANS), Skills USA-VICA, Associated Builders and Contractors (ABC), Associated General Contractors (AGC), National Center for Construction Education and Research (NCCER), Occupational Safety and Health Administration (OSHA), Environmental

Protection Agency, United States Department of Labor, Tennessee Department of Labor and Workforce Development

CARPENTRY I

STANDARD 5.0

Students will use appropriate hand and power tools to safely achieve industry accepted results.

LEARNING EXPECTATIONS

The student will:

5.1 Identify hand tools, portable power tools, and stationary power tools.
5.2 Explain the safe operation of hand tools, portable power tools, and stationary power tools.
5.3 Demonstrate proper use of hand tools, portable power tools, and stationary power tools.

PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET

The student:

5.1.A Selects hand tools, based on the name or intended use.
5.1.B Selects portable power tools, based on the name or intended use.
5.1.C Selects stationary power tools, based on the name or intended use.
5.2.A Explains the safe operation of a hand tool for an assigned task.
5.2.B Explains the safe operation of a portable power tool for an assigned task.
5.2.C Explains the safe operation of a stationary power tool for an assigned task.
5.3.A Completes an assigned task requiring the use of tools to an acceptable industry standard following safe operating procedures.

SAMPLE PERFORMANCE TASKS

These are sample projects of the type and scale recommended to address one or more of the learning expectations for this standard. Other projects can be used at the instructor's discretion.

- Given the need to remove a quarter-inch from the edge of a wood door, select and retrieve the proper tool.
- In the process of fabricating a flooring or wall system, cut dimensioned lumber to a specified length with an accuracy of $\pm 1/16$ inch.
- In the process of fabricating a flooring or wall system, construct joints properly using specified fasteners to an acceptable industry standard.

INTEGRATION/LINKAGES

Science, Computer Skills, Research and Writing skills, Language Arts, Communication Skills, Leadership Skills, Teamwork Skills, Applied Communications, Secretary's Commission on Achieving Necessary Skills (SCANS), Skills USA-VICA, Associated Builders and Contractors (ABC), Associated General Contractors (AGC), National Center for Construction Education and Research (NCCER), Occupational Safety and Health Administration (OSHA), Environmental Protection Agency, United States Department of Labor, Tennessee Department of Labor and Workforce Development

CARPENTRY I

STANDARD 6.0

Students will construct forms, install reinforcement, and place, finish, and cure concrete in accordance with construction drawings and specifications.

LEARNING EXPECTATIONS

The student will:

6.1 Distinguish various types of concrete based on composition and intended use.
6.2 Determine type and calculate the volume of concrete required by construction drawings and specifications.
6.3 Defend the need for and appreciate the importance of accurate placement of reinforcing components in concrete.
6.4 Plan and construct slab-and-beam forms for on-grade use.
6.5 Identify, install, and secure common reinforcing materials in beam and slab foundations using accepted industry practices.
6.6 Perform slump tests in accordance with typical industry practice.
6.7 Demonstrate knowledge of processes typically used to place and consolidate concrete.
6.8 Demonstrate basic concrete finishing and curing.

PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET

The student:

6.1.A Classifies American Society for Testing and Materials (ASTM) concrete types based on composition, conditions for placing, and specifications.
6.1.B Explains purpose and gives examples of common admixtures.
6.2.A Determines the type(s) of concrete required, given plans and specifications for a concrete structure.
6.2.B Determines the volume of concrete required, given plans and specifications for a concrete structure.
6.3.A Explains and demonstrates the difference in compression and tensile strength of concrete, and the consequent need for steel reinforcement.
6.4.A Designs and makes working drawings of the necessary forms and creates a written plan for the assembly, placing, and bracing of the forms, given plans and specifications for a slab-and-beam foundation.
6.4.B Executes the written plan to construct slab-and-beam forms for all or part of the specified foundation.
6.5.A Installs specified reinforcement using accepted industry practices, given plans and specifications for a slab-and-beam foundation and a previously constructed form.
6.6A Prepares a concrete mixture, conducts slump test, and compares the results with specifications.
6.7.A Describes the factors contributing to quality concrete placement.
6.7.B Demonstrates and/or describes correct methods for placing and consolidating concrete into forms.
6.8.A Demonstrates and/or describes correct methods for screeding the surface of placed concrete.
6.8.B Demonstrates and/or describes correct methods for tamping the surface of placed concrete.

6.8.C Demonstrates and/or describes correct methods for floating the surface of placed concrete.
6.8.D Demonstrates and/or describes correct methods for edging the corners of placed concrete.
6.8.E Demonstrates and/or describes correct methods for ensuring proper curing of concrete.

SAMPLE PERFORMANCE TASKS

These are sample projects of the type and scale recommended to address one or more of the learning expectations for this standard. Other projects can be used at the instructor's discretion.

- Take a field trip to observe large-scale form construction and reinforcement installation.
- Take a field trip to observe large-scale placing and finishing of concrete.
- Given a blueprint for a residential slab-and-beam foundation, produce working drawings of the required forms.
- Construct, install, and properly brace all or part of the forms necessary for the above slab-and-beam foundation.
- Install the specified reinforcing material in a section of the previously constructed forms for the above slab-and-beam foundation.
- Write a report or prepare a presentation describing placing and finishing of concrete observed during a field trip.
- Given shop drawings for reinforced concrete stair treads, design and construct forms; install reinforcement and mounting bolts; and place, finish, and cure the concrete.
- Given shop drawings for a two- or a three-step thin-shell reinforced concrete stair and landing; design and construct forms; install reinforcement; and place, finish, and cure the concrete.

INTEGRATION/LINKAGES

Science, Computer Skills, Research and Writing skills, Language Arts, Communication Skills, Leadership Skills, Teamwork Skills, Applied Communications, Secretary's Commission on Achieving Necessary Skills (SCANS), Skills USA-VICA, Associated Builders and Contractors (ABC), Associated General Contractors (AGC), National Center for Construction Education and Research (NCCER), Occupational Safety and Health Administration (OSHA), Environmental Protection Agency, United States Department of Labor, Tennessee Department of Labor and Workforce Development

STANDARD 7.0

Students will compare and contrast post-and-beam structures, platform structures, load-bearing walls, panel walls, and curtain walls.

LEARNING EXPECTATIONS

The student will:

7.1 Distinguish between post-and-beam and platform structures whether executed in wood or steel.
7.2 Plan the proper sequence of assembly for a multi-story post-and-beam structure.
7.3 Plan the proper sequence of assembly for a multi-story platform structure.
7.4 Analyze structural differences between load-bearing, panel, and curtain walls.

PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET

The student:

7.1.A Determines whether a structure is basically post-and-beam construction or platform construction, given drawings of the structure.
7.2.A Describes the sequence of assembly of structural framing, floors, walls, and roof of a multi-story post-and-beam structure.
7.3.A Describes the sequence of assembly of structural framing, floors, walls, and roof of a multi-story platform structure.
7.4.A Distinguishes between load-bearing and curtain walls.
7.4.B Compares and contrasts the materials used to construct load-bearing and curtain walls.
7.4.C Contrasts the scheduling differences in construction of load-bearing versus panel or curtain walls.
7.4.D Contrasts the forces resisted by load-bearing versus curtain walls.

SAMPLE PERFORMANCE TASKS

These are sample projects of the type and scale recommended to address one or more of the learning expectations for this standard. Other projects can be used at the instructor's discretion.

- Given photos, videos, or site visits of actual construction sites, distinguish between post-and-beam framing systems and platform framing systems executed in either steel or wood.
- Given photos, videos, or site visits of actual construction sites, determine whether walls are load-bearing or curtain.

INTEGRATION/LINKAGES

Science, Computer Skills, Research and Writing skills, Language Arts, Communication Skills, Leadership Skills, Teamwork Skills, Applied Communications, Secretary's Commission on Achieving Necessary Skills (SCANS), Skills USA-VICA, Associated Builders and Contractors (ABC), Associated General Contractors (AGC), National Center for Construction Education and Research (NCCER), Occupational Safety and Health Administration (OSHA), Environmental Protection Agency, United States Department of Labor, Tennessee Department of Labor and Workforce Development

CARPENTRY I

STANDARD 8.0

Students will compare and contrast dimensioned lumber, engineered shapes, and trussed structures for load-bearing span applications.

LEARNING EXPECTATIONS

The student will:

8.1 Distinguish between dimensioned lumber, engineered shapes, and fabricated trusses.

8.2 Compare and contrast dimensioned lumber, engineered shapes, and fabricated trusses for load-bearing span applications.

PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET

The student:

8.1.A Identifies dimensioned lumber, engineered shapes, and fabricated trusses from pictures, engineering drawings, or specifications.

8.2.A Compares the load-bearing capabilities of dimensioned lumber, engineered shapes, and fabricated trusses of comparable size.

8.2.B Compares the purchase price and installation costs of dimensioned lumber, engineered shapes, and fabricated trusses of comparable size.

SAMPLE PERFORMANCE TASKS

These are sample projects of the type and scale recommended to address one or more of the learning expectations for this standard. Other projects can be used at the instructor's discretion.

- Compare the load-bearing capability of dimensioned lumber and comparable engineered shapes, using manufacturer's information on engineered shapes.
- Compare the load-bearing capability of manufactured trusses and comparable engineered shapes, using manufacturer's information on each.
- For given specifications on a long-span load-bearing application, determine the most economical choice between dimensioned lumber, engineered shapes, and fabricated trusses.

INTEGRATION/LINKAGES

Science, Computer Skills, Research and Writing skills, Language Arts, Communication Skills, Leadership Skills, Teamwork Skills, Applied Communications, Secretary's Commission on Achieving Necessary Skills (SCANS), Skills USA-VICA, Associated Builders and Contractors (ABC), Associated General Contractors (AGC), National Center for Construction Education and Research (NCCER), Occupational Safety and Health Administration (OSHA), Environmental Protection Agency, United States Department of Labor, Tennessee Department of Labor and Workforce Development, NCCER 27104, 27105, 27106, 27305, 27408

STANDARD 9.0

Students will demonstrate the importance of bridging and diagonal bracing of floor and wall structures.

LEARNING EXPECTATIONS

The student will:

9.1 Demonstrate the necessity for bridge bracing between primary structural elements.
9.2 Demonstrate the necessity for diagonal bracing in wall structures.

PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET

The student:

9.1 Constructs a floor-system mockup and assesses its stability—with and without bridge bracing.
9.2 Constructs a wall-mockup and assesses its stability—with and without diagonal bracing.

SAMPLE PERFORMANCE TASKS

These are sample projects of the type and scale recommended to address one or more of the learning expectations for this standard. Other projects can be used at the instructor's discretion.

- Construct a 4-foot, scaled-down mockup of a floor system (e.g., 1 × 4 joists) and assess its stability before and after bracing is installed.
- Construct a mockup of a wall system and assess its stability with and without diagonal bracing.

INTEGRATION/LINKAGES

Science, Computer Skills, Research and Writing skills, Language Arts, Communication Skills, Leadership Skills, Teamwork Skills, Applied Communications, Secretary's Commission on Achieving Necessary Skills (SCANS), Skills USA-VICA, Associated Builders and Contractors (ABC), Associated General Contractors (AGC), National Center for Construction Education and Research (NCCER), Occupational Safety and Health Administration (OSHA), Environmental Protection Agency, United States Department of Labor, Tennessee Department of Labor and Workforce Development

CARPENTRY I

SAMPLING OF AVAILABLE RESOURCES

- National Center for Construction Education and Research (NCCER), *Core Curriculum*. Prentice Hall, Upper Saddle River, NJ; ©2000. Also known as the "Wheels of Learning" materials.
- National Center for Construction Education and Research (NCCER), *Carpentry Level One*. Prentice Hall, Upper Saddle River, NJ; ©2001. Also known as the "Wheels of Learning" materials.
- National Center for Construction Education and Research (NCCER), *Carpentry Level Two*. Prentice Hall, Upper Saddle River, NJ; ©1999. Also known as the "Wheels of Learning" materials.
- National Center for Construction Education and Research (NCCER), *Carpentry Level Three*. Prentice Hall, Upper Saddle River, NJ; ©1999. Also known as the "Wheels of Learning" materials.
- National Center for Construction Education and Research (NCCER), *Carpentry Level Four*. Prentice Hall, Upper Saddle River, NJ; ©1999. Also known as the "Wheels of Learning" materials.